

2001  
SURFACE WATER AMBIENT TOXIC  
MONITORING PROGRAM

EXECUTIVE SUMMARY

DIVISION OF ENVIRONMENTAL ASSESSMENT  
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION  
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## INTRODUCTION

The 2001 Surface Water Ambient Toxic (SWAT) monitoring program final report is organized into an executive summary and 4 modules, 1) Marine and Estuarine, 2) Lakes, 3) Rivers and Streams, and 4) Special Studies. Within each module results are presented in the order of the 2001 workplan. There are also a separate appendix with fish lengths and weights for all modules.

The full report is available on DEP's website at  
<http://www.state.me.us/dep/blwq/monitoring.htm>

Click on "programs", then scan down the page to "Surface Water Ambient Toxics Monitoring Program (SWAT)" and choose the module of your interest.

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Most chemical analyses were performed by the Senator George J. Mitchell Center for Environmental and Watershed Research Environmental Chemistry Laboratory at the University of Maine. Other analyses were conducted as listed in reports of individual sections.

## **EXECUTIVE SUMMARY**

Maine's Surface Water Ambient Toxics (SWAT) monitoring program was established in 1993 (38 MRSA §420-B) to determine the nature, scope and severity of toxic contamination in the surface waters and fisheries of the State. The program must be designed to comprehensively monitor the lakes, rivers and streams and marine and estuarine waters of the State on an ongoing basis. The program must incorporate testing for suspected toxic contamination in biological tissue and sediment, may include testing of the water column and must include biomonitoring and the monitoring of the health of individual organisms that may serve as indicators of toxic contamination. This program must collect data sufficient to support assessment of the risks to human and ecological health posed by the direct and indirect discharge of toxic contaminants.

The Commissioner of the Department of Environmental Protection (DEP) must prepare a 5 year workplan that outlines monitoring objectives for the following 5 years. The Commissioner must also develop an annual workplan that defines the work to be accomplished each year. A Technical Advisory Group (TAG), composed of 10 individuals with scientific backgrounds representing various interests and 1 legislator, is established to advise the Commissioner on the development of the 5-year and annual workplans.

The first 5-year plan, for the period 1994-1998, was an initial survey of waterbodies from watersheds around the entire state. The current 5-year plan, for the period 1999-2003, is focused on problems discovered in the initial sampling and is designed to confirm the initial findings and establish background conditions. Once those are established and a sufficient amount of time has elapsed, 5-10 years depending on what if any action has occurred to solve the problem, repeat sampling may be conducted to establish trends. The program also explores new issues.

The SWAT program is divided into 4 modules, 1) Marine and Estuarine, 2) Lakes, 3) Rivers and Streams, and 4) Special Studies. This annual report follows the outline of the 2000 workplan.

Following is a summary of key findings from the 2000 SWAT program for each module.

### **1. MARINE AND ESTUARINE**

- Levels of mercury in blue mussels were elevated in the Sheepscot, Pepperell Cove in Kittery and at the mouth of the Penobscot River in 2001 and in the late 1980s. The latter two sites have local potential sources of mercury and the Sheepscot is presumed to be elevated because of historic sources. Levels of other metals were lower in 2001 than in the late 1980s at many sites including the Sheepscot and the Penobscot. Pepperell Cove near the naval base in Kittery had elevated or high normal range metals at both sampling periods. At the mouth of an abandoned mine in Cape Rosier a number of metals were elevated in the 1989 and 2001 samplings. One area of concern is Diamond Cove, on Great Diamond Island in Casco Bay where levels of lead are much higher than in 1989. Other locations had lower levels of metals or normal levels at both samplings with some exceptions. Nickel was elevated in some of the 2001 samples but the individual replicates had variable results. Silver was elevated at two locations and also had variable results for individual replicates.

- Mercury and PCB levels in striped bass and bluefish have been monitored from a number of waters over the last few years. Levels of both contaminants in fish from most rivers exceed the Maine Bureau of Health Fish Tissue Action Levels. Monitoring in 2001 showed mercury levels in bluefish from the Kennebec River, and in striped bass from the Penobscot River and York River similar to those of previous years. PCBs, however were the highest ever measured in these species. Comprehensive monitoring of these fish from up to 7 rivers will be conducted in 2002.
- While limited by the relatively small number of seals sampled from each region, regional comparisons suggest that seals that breed and pup along southern and mid-coast Maine have body burdens of PCBs, OC pesticides, and mercury comparable to or higher than levels in seals in polluted industrial areas along the Northeast coast. PCB levels detected in seals (predominantly harbor seals) throughout the Gulf of Maine are comparable to or higher than the known threshold level for adverse immune, reproductive, and endocrine effects documented in captive feeding studies on harbor seals and an order of magnitude higher than levels associated with reduced immune responses and endocrine alterations in some species of seals. These levels are of concern given the declining pupping rates observed among harbor seals in southern and mid-coast Maine.

## 2. LAKES

- Despite being a dry year, in 2001 monitoring of mercury in rain, snow, and sleet at 4 locations in Maine as part of the national Mercury Deposition Network continued to document that coastal areas receive more mercury deposition than do inland areas. These results implicate the US eastern seaboard as well as other upwind states as significant sources of mercury to Maine. National data show that deposition is higher in most other eastern and mid-western states that are in the program and presumably closer to major sources.
- A total of 23 samples of one to five fish each of trout and salmon were collected from 18 lakes and ponds by the Department of Inland Fisheries and Wildlife for mercury analysis. A total of 8 samples of one to five fish each were also collected by the Lakes Environmental Association from 4 lakes in the Bridgton area for mercury analysis. Concentrations of mercury in all lake trout, brown trout, landlocked salmon, largemouth bass, smallmouth bass and all but one brook trout and splake exceeded the Maine Bureau of Health's Fish Tissue Action Level (0.2 ppm). Concentrations of mercury in chain pickerel from 4 lakes were the highest of all species and correlated with length.
- Studies of the effects of mercury on loons indicate that loons with high concentrations of mercury exhibit impacts to survival and behavior. As a result they fledged 40% fewer young than loons with low concentrations of mercury. This translates to placing 26% of Maine's loons at risk, predicting an erosion of the birds providing a reproductive buffer and leading to an unsustainable population. Monitoring of fish gathered limited data for establishment of a statewide bioaccumulation factor. This study is part of a multi-year effort to establish a wildlife criterion for mercury as required under state statute.

### 3. RIVERS AND STREAMS

- Dioxin concentrations in trout from the Androscoggin River at Gilead and the Kennebec River at Fairfield, and suckers from the Androscoggin River at Rumford and Riley exceeded the Maine Bureau of Health's Fish Tissue Action Level for cancer. Coplanar PCB concentrations exceeded the Fish Tissue Action Level for cancer for many samples as well. The combination of dioxins and dioxin-like coplanar PCBs resulted in all fish sampled from the Androscoggin River and fish from many other stations as well exceeding the Fish Tissue Action Level for reproductive effects. Dioxin concentrations were slightly higher than those in 2000 in 8 samples, slightly lower in 8 samples, and similar in the remainder. CTEh concentrations were similar to those from 2000 at most stations.
- Preliminary studies of the effects of endocrine disruption on reproduction of fish downstream of major discharges from municipal treatment plants and pulp and paper mills on the Androscoggin River indicated some reduction, but not elimination of effects since a similar study in 1994. The study will be repeated in 2002.
- A significant finding from the SWAT biological monitoring program is the extent of detrimental impacts to small streams, caused by non-point source toxics and physical disturbance in urban areas. Although only ten of thirty-five stations have been processed for the year 2001, six of the stations analyzed fail to attain minimum aquatic life standards of their assigned class. All of these are stations located on small urban streams.

### 4. SPECIAL STUDIES

- Development of the use of semi-permeable membrane devices, SPMDs, as a potential surrogate for the fish above/below test for discharge of dioxins from bleached kraft pulp mills continued at the University of Maine in 2001. Unlike the 2000 study, the 2001 study resulted in detection of 2378-TCDD. As in 2000, 2378-TCDF was measured in all samples also. Within-site variability in concentrations was slightly better than in 2000 in some samples, as a result of improvements in the analyses, but was still no better than that measured in fish; therefore, sensitivity of SPMD tests were generally no better than that of fish. Development of the SPMD method continued in 2002.
- Mercury levels were found to be greater in mink vs. otter, interior vs. coastal populations, and females vs. males. Respective mean mercury levels in otter and mink fur, 19.6 and 21.8 ppm, were near concentrations considered to have adverse effects in other studies. The proportion of sampled populations exceeding 20 ppm in the fur was 61% for otter and 47% for mink, yet brain and liver Hg levels were well below published lethal levels. Studies will continue in 2002 toward establishment of a wildlife criterion for mercury.

- Preliminary studies at the University of Maine have resulted in increased efficiency and lower detection of methylmercury. This effort is part of the development of a bioaccumulation factor for regulatory use with Maine's new fish Tissue Residue Criterion for mercury. Studies will continue in 2002.

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